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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR   | ATTORNEY DOCKET NO.         | CONFIRMATION NO. |
|--|-------------|------------------------|-----------------------------|------------------|
| 10/524,814   | 05/05/2006  | Sang-In Lee            | A-71720/MSS<br>(463035-813) | 1997             |
| 32940 7590 03/04/2009<br>DORSEY & WHITNEY LLP<br>INTELLECTUAL PROPERTY DEPARTMENT<br>370 SEVENTEENTH STREET<br>SUITE 4700<br>DENVER, CO 80202-5647 |             |                        |                             |                  |
| EXAMINER<br>SMITH, BRADLEY   |             |                        |                             |                  |
| ART UNIT<br>2894   |             | PAPER NUMBER           |                             |                  |
| MAIL DATE<br>03/04/2009  |             | DELIVERY MODE<br>PAPER |                             |                  |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/524,814

**Applicant(s)**

LEE ET AL.

**Examiner**

Bradley K. Smith

**Art Unit**

2894

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 November 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,4-6 and 8-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-6 and 8-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 February 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB08)
- Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(c) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by Metzner et al. (US Patent 7,067,439). Metzner disclose (i) introducing separate pulses of metal alkyl amide and ozone into a reaction chamber containing a substrate, wherein said metal is a Group 4 metal Hafnium (ii) repeating step (i) until a film of a target thickness is achieved(col. 2 lines 10-27). Regarding claim 2, Metzner disclose the metal oxide is hafnium oxide. Regarding claim 3, Metzner disclose the metal alkyl amide has the formula  $M(NR^1R^2)_4$ , wherein M represents a Group 4 metal,  $R^1$  is an ethyl unit, and  $R^2$  is a methyl unit (col. 2 lines 25-27). Regarding claim 4, Metzner disclose the substrate is silicon.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5, 6, 8-10, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Metzner (7,067,439) in view of Metzner (6,858,547). Metzner ('439) disclose (i) introducing separate pulses of metal alkyl amide and ozone into a reaction chamber containing a substrate, wherein said metal is a Group 4 metal Hafnium (ii) repeating step (i) until a film of a target thickness is achieved( see column 2 lines 10-35). Regarding claim 5, Metzner ('439) disclose (i) growing a metal oxide mono layer on a substrate by atomic layer deposition (see column 2 lines 66-67) by introducing separate pulses of a metal alkyl amide and ozone (see column 3 line 36) into a reaction chamber containing a substrate, wherein said metal is a Group 4 metal; (ii) repeating step (i) until a dielectric film of a target thickness is achieved and Metzner ('439) disclose the metal alkyl amide has the formula  $M(NR^1R^2)_4$ , wherein M represents a Group 4 metal,  $R^1$  is an ethyl unit, and  $R^2$  is a methyl unit (col. 2 lines 25-27). Regarding claims 6 and 10, Metzner ('439) disclose the metal oxides are hafnium oxide. Regarding claim 9, Metzner ('439) disclose (i) forming a metal oxide mono layer by atomic layer deposition by introducing separate pulses of a metal alkyl amide precursor and ozone into a reaction chamber containing a substrate, wherein said metal is a Group 4 metal; (ii) repeating step (i) until a film of a target thickness is achieved; and (iii) and Metzner ('439) disclose the metal alkyl amide has the formula  $M(NR^1R^2)_4$ , wherein M represents a Group 4 metal,  $R^1$  is an ethyl unit, and  $R^2$  is a methyl unit (col. 2 lines 25-27). Regarding claim 10, Metzner ('439) disclose the metal oxide is hafnium oxide. Metzner ('439) disclose the metal alkyl amide has the formula  $M(NR^1R^2)_4$ , wherein M represents a Group 4 metal,  $R^1$  is an ethyl unit, and  $R^2$  is a methyl unit.

Metzner ('439) fails to disclose the formation of an electrode on top of the dielectric layer and the dielectric layer being formed between two electrodes.

However Metzner ('547) disclose the formation of an electrode on top of the dielectric layer and the dielectric layer (220) being formed between two electrodes (the substrate being one of the two electrodes (reads on claim 12) (see figure 2)). Regarding claims 4, and 8 Metzner ('547) disclose forming the hafnium oxide on a silicon substrate. Therefore it would have been obvious to combine the teachings of Metzner ('439) and Metzner ('547) because the hafnium oxide can be used at large enough thickness to reduce current leakage capacity and still provide high gate capacitance (see column 2 lines 36-40 Metzner ('547).

#### ***Response to Arguments***

Applicant's arguments filed 11/25/08 have been fully considered but they are not persuasive. The applicant contends that Metzner does not teach a metal alkyl amide formula where R<sup>1</sup> is an ethyl unit and R<sup>2</sup> is a methyl unit. The examiner disagrees. The examiner would like to direct the applicant's attention to column 2 line 23-27 of Metzner (US 7,067,439) which discloses "An exemplary embodiment of the invention deposits surprisingly uniform films of hafnium oxide from compounds that include the structure  $Hf(NR'R)_{4n}$ , wherein either or both of R' and R is an alkyl group having from one to four carbon atoms, and where R' and R may be the same group or may be different groups."

#### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bradley K. Smith whose telephone number is 571-272-1884. The examiner can normally be reached on 10-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Nguyen can be reached on 571-272-2402. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Bradley K Smith/  
Primary Examiner, Art Unit 2894

Application/Control Number: 10/524,814  
Art Unit: 2894

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